WHAT IS CLAIMED IS:

1. A stereoscopic image displaying method, wherein, when image information displayed on an image displaying device is observed three-dimensionally by

5   guiding display light from an image corresponding to a viewpoint of one parallax image on said image displaying device, on which parallax images corresponding to a plurality of different viewpoints can be displayed, to an optical modulator, on which a

10   light transmitting section and a light shielding section can be formed, by a second optical system disposed in the front of said image displaying device, and collecting the display light transmitted through said light transmitting section of said optical

15   modulator at a position, which is a predetermined distance apart, corresponding to the viewpoint on an observation surface, by a first optical system, the entire screen of a parallax image to be displayed on said image displaying device is caused to be incident

20   on each eye by controlling transmitted light from said optical modulator in synchronism with the switching of parallax images to be displayed on said image displaying device.

25   2. A stereoscopic image displaying method according to claim 1, wherein
     a first synthesized parallax image in which one

stripe image is synthesized by dividing two parallax

images for the right and the left eyes to horizontal

stripe pixels, respectively, and arranging horizontal

stripe pixels for the left and the right eyes in a

5   predetermined order, and a second synthesized parallax

image that is an interpolation image of said first

synthesized parallax image which is synthesized by

changing its order of arrangement are alternately

displayed on said image displaying device.

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3. A stereoscopic image displaying method

according to claim 2, wherein

the change of said synthesized parallax image to

be displayed on said image displaying device and the

15   control for forming said light transmitting section and

said light shielding section are performed

synchronously for each pixel of said image displaying

device or each scan line.

20   4. A stereoscopic image displaying method

according to claim 1, 2 or 3, wherein

said optical modulator uses a liquid crystal

shutter that has pixels of a matrix structure or an

oblong pixel structure.

25

5. A stereoscopic image displaying method

according to claim 1, wherein

two parallax images for the right and the left
eyes are alternately displayed on said image displaying
device.

5   6.   A stereoscopic image displaying method
according to claim 1, wherein

said image displaying device emits predetermined
polarized light.

10   7.   A stereoscopic image displaying method
according to claim 6, wherein

said optical modulator has a first phase shift
member for giving two different phase shift states to
transmitted light by an electric signal and a polarized
15   optical device for partially transmitting predetermined
polarized light only which is provided in a
predetermined position to the front of said first phase
shift member.

20   8.   A stereoscopic image displaying method
according to claim 7, wherein

said polarized optical device is configured by
arranging two polarization plates on which optical axes
are perpendicular to each other in a checkered pattern.

25

9.   A stereoscopic image displaying method
according to claim 7, wherein

said polarized optical device is configured by alternately arranging two polarization plates on which optical axes are perpendicular to each other in the horizontal direction in a stripe pattern that is long

5   in the vertical direction.

10.   A stereoscopic image displaying method according to claim 7, 8 or 9, wherein

said polarized optical device comprises a second

10   phase shift member and a polarizing plate, and its phase is processed as 0 and π in a pattern in which said second phase shift member is arranged in a checkered pattern or a stripe pattern that is long in the vertical direction.

15

11.   A stereoscopic image displaying method according to claim 6, wherein

said optical modulator has a first phase shift member for giving two different phase shift states to

20   transmitted light by an electric signal, and said first shift member is arranged between said image displaying device and said second optical system.

12.   A stereoscopic image displaying method

25   according to claim 6, wherein

said image displaying device has an automatic light emission display apparatus and a polarizing plate.

13. A stereoscopic image displaying method according to claim 1, wherein

a 2D image (an image without parallax) is displayed on a part of or the entirety of said image

5   displaying device.

14. A stereoscopic image displaying method according to claim 1, wherein

said second optical system focuses an image of

10   said image displaying device on said optical modulator in the vertical direction, and a focal point position of said second optical system and the position of said optical modulator substantially coincide with each other in the horizontal direction.

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15. A stereoscopic image displaying method according to claim 1, wherein

said first optical system and said second optical system have predetermined periodic structures in the

20   horizontal direction, and said second optical system and/or said image displaying device are disposed on a face on which a multiplicity of straight lines cross, which connect the left and the right pupils and the center in the horizontal direction of each optical

25   element forming said first optical system.

16. A stereoscopic image displaying method

according to claim 1, wherein

said second optical system has a predetermined periodic structure in the horizontal and vertical directions, respectively, and said optical element forming one period in the horizontal and vertical directions has optical actions that are different in the horizontal direction and the vertical direction.

17. A stereoscopic image displaying method according to claim 1, wherein

a crossing point of a multiplicity of straight lines that connect the left and the right pupils and the center in the horizontal direction of each optical element forming said first optical system, and the center in the horizontal direction of each optical device forming said second optical system coincide with each other, and/or the center in the horizontal direction of pixels forming said image displaying device coincide with them.

18. A stereoscopic image displaying method according to any one of claims 1, 2, 3 and 5, wherein

when the left and the right pupils are apart by an interval E, a period in the horizontal direction of said optical element forming said first optical system is HL1, a width in the horizontal direction of said light transmitting section of said optical modulator is

Hm, a period in the horizontal direction of said optical element forming said second optical system is HL2, a pixel pitch in the horizontal direction of said image displaying device is Hd, optical distances

5 between said first optical system and said second optical system and said first optical system and said image displaying device are LhL2 and Lhd, respectively, an optical distance from the observation surface to said first optical system is Lh0, an optical distance

10 from a crossing face that is the first one counted from said first optical system in the direction to said image displaying device among faces on which a group of light beams connecting the left and the right pupils and each pixel of said image displaying device cross is

15 Lh1, an optical distance from said first optical system to said optical modulator is Lh1a, an optical distance from said first optical system to a crossing face that is the first one counted from said first optical system in the direction to said image displaying device is

20 Lh1b, and both Nd and NL2 are integral numbers of 2 or more, the following relation is realized:

$$Nd*HL1/E=Lhd/(Lhd+Lh0) \quad ... \quad (h1)$$

$$Hd/HL1=(Lh0+Lhd)/Lh0 \quad ... \quad (h2)$$

$$NL2*HL1/E=LhL2/(LhL2+Lh0) \quad ... \quad (h3)$$

25 $$HL2/HL1=(Lh0+LhL2)/Lh0 \quad ... \quad (h4)$$

$$H1/E=Lh1/(Lh1+Lh0) \quad ... \quad (h5)$$

$$H1/HL1=(Lh1+Lh0)/Lh0 \quad ... \quad (h6)$$

$$H1*Lh1a/Lh1=HL1*Lh1b/Lh1 \ldots (h7)$$

$$Lh1a+Lh1b=Lh1 \ldots (h8)$$

$$Hm/H1=Lh1a/Lh1 \ldots (h9)$$

5   19. A stereoscopic image displaying method
according to claim 4, wherein

when the left and the right pupils are apart by an
interval E, a period in the horizontal direction of
said optical element forming said first optical system
10   is HL1, a width in the horizontal direction of said
light transmitting section of said optical modulator is
Hm, a period in the horizontal direction of said
optical element forming said second optical system is
HL2, a pixel pitch in the horizontal direction of said
15   image displaying device is Hd, optical distances
between said first optical system and said second
optical system and said first optical system and said
image displaying device are LhL2 and Lhd, respectively,
an optical distance from the observation surface to
20   said first optical system is Lh0, an optical distance
from a crossing face that is the first one counted from
said first optical system in the direction to said
image displaying device among faces on which a group of
light beams connecting the left and the right pupils
25   and each pixel of said image displaying device cross is
Lh1, an optical distance from said first optical system
to said optical modulator is Lh1a, an optical distance

from said first optical system to a crossing face that
is the first one counted from said first optical system
in the direction to said image displaying device is
Lh1b, and both Nd and NL2 are integral numbers of 2 or

5   more, the following relation is realized:

$$Nd*HL1/E=Lhd/(Ldh+Lh0) \ ... \ (h1)$$

$$Hd/HL1=(Lh0+Lhd)/Lh0 \ ... \ (h2)$$

$$NL2*HL1/E=LhL2/(LhL2+Lh0) \ ... \ (h3)$$

$$HL2/HL1=(Lh0+LhL2)/Lh0 \ ... \ (h4)$$

10     $$H1/E=Lh1/(Lh1+Lh0) \ ... \ (h5)$$

$$H1/HL1=(Lh1+Lh0)/Lh0 \ ... \ (h6)$$

$$H1*Lh1a/Lh1=HL1*Lh1b/Lh1 \ ... \ (h7)$$

$$Lh1a+Lh1b=Lh1 \ ... \ (h8)$$

$$Hm/H1=Lh1a/Lh1 \ ... \ (h9)$$

15

20.   A stereoscopic image displaying method
according to any one of claims 1, 2, 3 and 5, wherein
       when a pixel pitch in the vertical direction of
said image displaying device is Vd, a width in the

20   vertical direction of said light transmitting section
or said light shielding section of said optical
modulator is Vm, an optical distance from said image
displaying device to a face having optical actions in
the vertical direction of said second optical system is

25   Lv1, an optical distance from a face having optical
actions in the vertical direction of said second
optical system to said optical modulator is Lv2, a

focal distance in the vertical direction of each optical element forming said second optical system is fv, and an optical distance between said optical modulator and an observation surface is Lv0, the

5 following relation is realized:

$$Vd:Vm=Lv1:Lv2 \ldots (v1)$$

$$2 \cdot Vd:VL=Lv1+Lv2:Lv2 \ldots (v2)$$

$$1/Lv1+1/Lv2=1/fv \ldots (v3)$$

$$Vd:VL=Lv0+Lv1+Lv2:Lv0+Lv2 \ldots (v4)$$

10

21. A stereoscopic image displaying method according to claim 4, wherein

when a pixel pitch in the vertical direction of said image displaying device is Vd, a width in the

15 vertical direction of said light transmitting section or said light shielding section of said optical modulator is Vm, an optical distance from said image displaying device to a face having optical actions in the vertical direction of said second optical system is

20 Lv1, an optical distance from a face having optical actions in the vertical direction of said second optical system to said optical modulator is Lv2, a focal distance in the vertical direction of each optical element forming said second optical system is

25 fv, and an optical distance between said optical modulator and an observation surface is Lv0, the following relation is realized:

$$Vd:Vm=Lv1:Lv2 \ldots (v1)$$

$$2 \cdot Vd:VL=Lv1+Lv2:Lv2 \ldots (v2)$$

$$1/Lv1+1/Lv2=1/fv \ldots (v3)$$

$$Vd:VL=Lv0+Lv1+Lv2:Lv0+Lv2 \ldots (v4)$$

22. A stereoscopic image displaying method according to claim 18, wherein

when a pixel pitch in the vertical direction of said image displaying device is Vd, a width in the vertical direction of said light transmitting section or said light shielding section of said optical modulator is Vm, an optical distance from said image displaying device to a face having optical actions in the vertical direction of said second optical system is $Lv1$, an optical distance from a face having optical actions in the vertical direction of said second optical system to said optical modulator is $Lv2$, a focal distance in the vertical direction of each optical element forming said second optical system is fv, and an optical distance between said optical modulator and an observation surface is $Lv0$, the following relation is realized:

$$Vd:Vm=Lv1:Lv2 \ldots (v1)$$

$$2 \cdot Vd:VL=Lv1+Lv2:Lv2 \ldots (v2)$$

$$1/Lv1+1/Lv2=1/fv \ldots (v3)$$

$$Vd:VL=Lv0+Lv1+Lv2:Lv0+Lv2 \ldots (v4)$$

23. A stereoscopic image displaying method according to claim 19, wherein

when a pixel pitch in the vertical direction of said image displaying device is Vd, a width in the vertical direction of said light transmitting section or said light shielding section of said optical modulator is Vm, an optical distance from said image displaying device to a face having optical actions in the vertical direction of said second optical system is Lv1, an optical distance from a face having optical actions in the vertical direction of said second optical system to said optical modulator is Lv2, a focal distance in the vertical direction of each optical element forming said second optical system is fv, and an optical distance between said optical modulator and an observation surface is Lv0, the following relation is realized:

$$Vd:Vm=Lv1:Lv2 \ldots (v1)$$

$$2 \cdot Vd:VL=Lv1+Lv2:Lv2 \ldots (v2)$$

$$1/Lv1+1/Lv2=1/fv \ldots (v3)$$

$$Vd:VL=Lv0+Lv1+Lv2:Lv0+Lv2 \ldots (v4)$$

24. A stereoscopic image displaying method according to any one of claims 1 through 3, 5 through 9 and 11 through 17, wherein

said first and second optical systems have lenticular lenses.

25. A stereoscopic image displaying method according to claim 4, wherein

said first and second optical systems have lenticular lenses.

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26. A stereoscopic image displaying method according to claim 10, wherein

said first and second optical systems have lenticular lenses.

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27. A stereoscopic image displaying method according to claim 18, wherein

said first and second optical systems have lenticular lenses.

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28. A stereoscopic image displaying method according to claim 19, wherein

said first and second optical systems have lenticular lenses.

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29. A stereoscopic image displaying method, wherein each of parallax images corresponding to a plurality of different viewpoints is made a predetermined stripe image, display light, which is

25   from a stripe image corresponding to one viewpoint of a synthesized parallax image on an image displaying device that can alternately display a synthesized

parallax image in which the stripe images is arranged in a predetermined order and synthesized and a synthesized parallax image in which the arrangement is changed, is guided to an optical modulator, which is

5 formed in synchronism with the change of a synthesized parallax image that displays a predetermined pitch of light transmitting section and light shielding section by a second optical system disposed in the front of said image displaying device, display light that has

10 transmitted through said light transmitting section of said optical modulator are collected at a position corresponding to a viewpoint on an observation face by a first optical system, and stereoscopic observation of image information displayed on said image displaying

15 device is thereby performed.

30. A stereoscopic image displaying method according to claim 29, wherein

display light reaching a viewpoint position of an
20 observer that correspond to the stripe image among said display light emitted from pixels forming each of said stripe image is collected in said optical modulator so as to be transmitted through said light shielding section of said optical modulator by said second
25 optical system, and the other light is shielded by said light shielding section.

31. A stereoscopic image displaying method according to claim 29 or 30, wherein

said second optical system forms an image of pixels of said image displaying device on said optical

5 modulator in the vertical direction, and a focal point position and the position of said optical modulator substantially coincide with each other in the horizontal direction.

10 32. A stereoscopic image displaying apparatus, wherein a stereoscopic image displaying method according to any one of claims 1 through 3, 5 through 9 and 11 through 17 is used.

15 33. A stereoscopic image displaying apparatus, wherein a stereoscopic image displaying method according to claim 4 is used.

34. A stereoscopic image displaying apparatus,
20 wherein a stereoscopic image displaying method according to claim 10 is used.

35. A stereoscopic image displaying apparatus, wherein a stereoscopic image displaying method
25 according to claim 18 is used.

36. A stereoscopic image displaying apparatus,

wherein a stereoscopic image displaying method
according to claim 19 is used.

37. A stereoscopic image displaying apparatus,
5 wherein a stereoscopic image displaying method
according to any one of claim 29 or 30 is used.

38. A stereoscopic image displaying apparatus,
wherein a stereoscopic image displaying method
10 according to claim 31 is used.